

DARPA Data in the Optical Domain Workshop

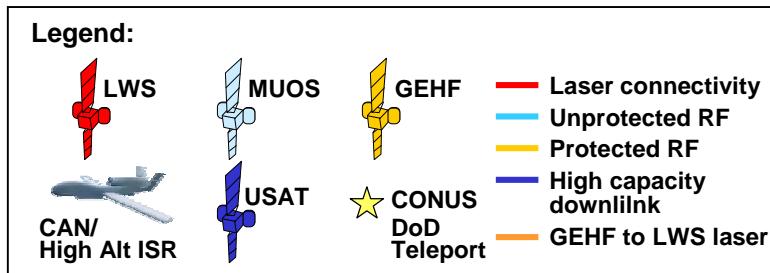
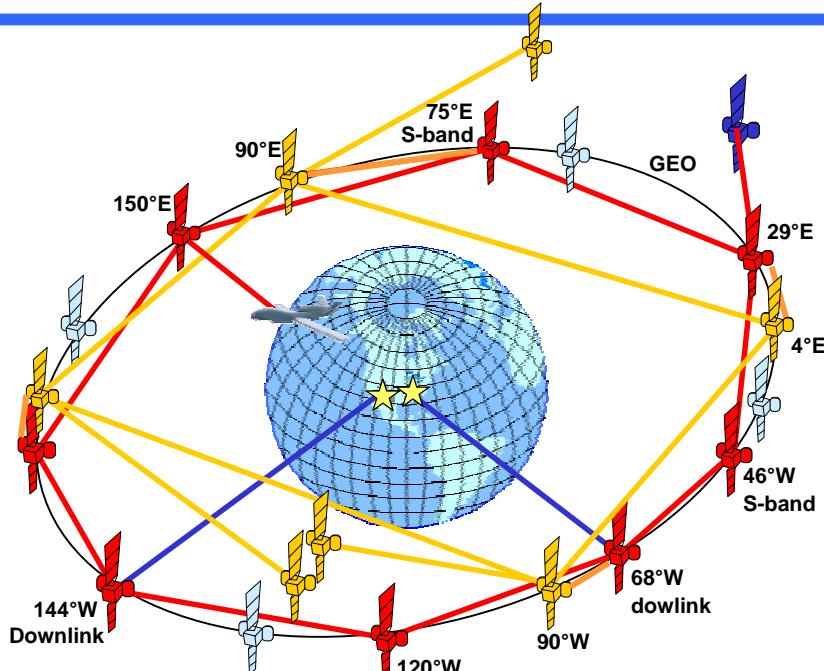


Boeing Integrated Defense Systems (IDS)
Boeing Satellite Systems (BSS)
El Segundo, California

Tuesday March 18th 2003

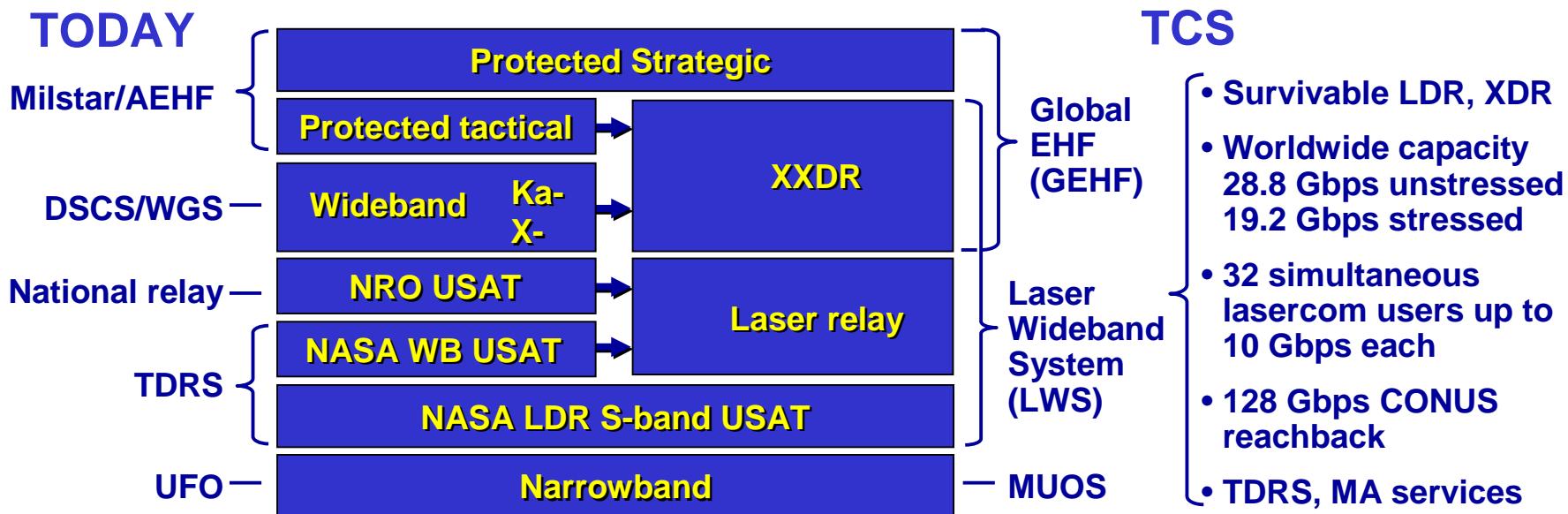
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Flexible Network of Networks Integrates ISR and Tactical Communications



- Robust internetworking between tactical, strategic users
- High multiplicity of EHF-capable satellites offers high focused capacity and path diversity
- Laser backbone for high throughput and low latency CONUS reachback
- Interoperable with other assets, networks
- Frequency coordination achievable for selected orbital slots

System Integrated for Cost-effective TCS



Flexible and scalable architecture enables network-centric operations:

- Fully internetworked for communications independent of platform or geography
- Laser communication relay services integrates space and airborne ISR support
- Improves warfighter communication with “XXDR” dynamic bandwidth, packet switching, and reduced terminal diversity
- Efficient accommodation of user QoS needs via optimized communication services (IP for tactical internetworking, TDM circuit switching for ISR sensor data links, label switched for legacy circuit switched services.)
- Scalable network management architecture achieved by collaboration among network management systems

BSS Expertise



BOEING®

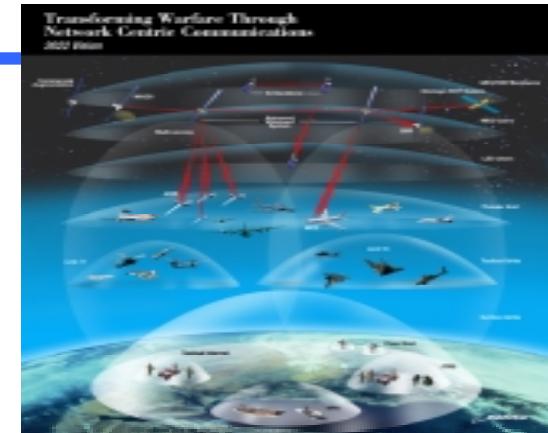
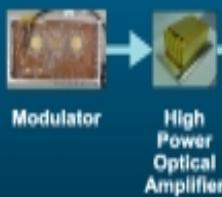
- System Engineering
 - Large Systems Integrator, TCA
- Lasercom since 1994
 - Optical devices developed with HRL



Power and
Control
Electronics



Optical
Telescope



• High Speed Digital Data Routing

DATA SWITCHES

First BSS
32-Circuit Switch



Commercial
TDM Comm Processor
50 Mbps Switch (1985)

BSS Gen I Regenerative
45-Circuit Switches



Gov. EHF Programs
150 Kbps Switch (1991, 94)

BSS Generation II & III
25,000-Circuit Switches



Comm'l Mobile Programs
1.6 Gbps Switch (1995, 98)

BSS Ultra High Speed
Packet Switch



28 to 112 Gbps (1999)

80 Gbps Switch (2003)

BSS Generation iv
Intelligent ATM Packet Switch



Commercial Multimedia Program
12.8 Gbps Switch (2002)

Notional Requirements

Optical Router

- > 10 Gbps per Channel
- 16 x 16 Router
- Packet Switching
- IP Routing
- Multicasting, Unicast, packet regeneration
- Minimal data Latency

Space Based Systems

- Low Mass, 10 Kg
- Low Power, 10 Watts
- High Reliability, 10 year
- Space Qualification
- Scalability

Key Issues / Major Challenges



- Optical Packet Synchronization
 - network time references
- Optical Packet Buffering
- Optical Packet Header Recognition
- Optical Packet Switching
- Optical Logic Devices
- High rate optical device packaging
- Space qualification of devices may drive architectures
 - temperature variation
 - radiation environment (SEU)